

***Laternea triscapa*, an enigmatic stinkhorn from the Atlantic Forest of Northeast Brazil**

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ABSTRACT — A specimen of *Laternea* was found in the Barra do Rio Mamanguape Environmental Protected Area, Paraíba, Brazil. The basidioma is composed of four vertical arms joined at the apex, and it presents a pendant glebifer below the junction. It is described here as an authentic specimen of *L. triscapa* from Northeast Brazil, with photographs and drawings of the basidioma and microstructures, and discussion of the names attributed to the genus.

KEY WORDS — *Clathraceae*, neotropics, *Phallales*, *Phallomycetidae*, taxonomy

Introduction

Clathraceae Chevall. is a recently rearranged family that groups the genera *Abrachium* Baseia & T.S. Cabral, *Aseroe* Labill., *Blumenavia* Möller, *Clathrus* P. Micheli ex L., *Ileodictyon* Tul. & C. Tul., *Laternea* Turpin, and *Pseudocolus* Lloyd (Melanda & al. 2021). *Laternea* was originally described to accommodate *L. triscapa*, a species with basidiomata usually characterized by three vertical

arms, joined at the apex with the gleba present only below this junction, differing from *Clathrus* in having a pendant glebifer (Levrault 1822, Linder 1928). Later, Cunningham (1931a, 1931b, 1944) proposed that the genera *Laternea*, *Linderiella* G. Cunn., and *Blumenavia* constituted a validly named tribe *Columnateae* G. Cunn. (see Turland & al. 2018: Art. 39.1) within *Clathraceae* characterized by the receptacle composed of vertical arms joined at the apex. The other two tribes proposed by Cunningham were *Clathrateae* G. Cunn., characterized by the receptacle composed of interconnected arms forming a cage, and *Stellateae* G. Cunn., characterized by pseudostipitate basidiomata with a branched part at the top. Dring (1980) concurred in including *Laternea* as a separate genus from *Clathrus*, differentiated mostly by the form of receptacle and the position of the glebifer. Later, Pegler & Gómez (1994) considered three types of basidiomata in *Clathraceae*, namely the clathroid, lysurioid and laternoid series, with the last of these including the genera *Laternea* and *Linderiella*, differing from the other series by the gleba being confined to the inner part of the joined arms at the top of the basidioma.

The *Laternea* type species, *L. triscapa*, was described from Île de la Tortue, Haiti (Levrault 1822). In Brazil, *L. triscapa*, *L. pusilla* Berk. & M.A. Curtis, and *L. dringii* A. López & al. have been recorded (Rick 1961, Bononi & al. 1984, Meijer 2006, Magnago & al. 2013, Lima & al. 2019, Trierveiler-Pereira & al. 2019). Entities identified as *Laternea triscapa* were cited from Rio Grande do Sul (Rick 1961), and São Paulo (Bononi & al. 1984); however, specimens from Northeast Brazil (Baseia & al. 2006, Leite & al. 2007) were equivocally cited, and actually belong to *Clathrus* sensu Dring (1980) due to the gleba dispersed in the inner surface of the arms, without a pendant glebifer.

Our work aims to report authentic specimen of *Laternea triscapa* from Northeast Brazil, as well as discussing other *Laternea* names reported for this region.

Materials & methods

The specimen was collected in the Área de Proteção Ambiental (APA) Barra do Rio Mamanguape, an area of 14,460 ha located among the municipalities of Rio Tinto, Marcação, and Lucena (6.83°S 34.92°W). The vegetation comprises Atlantic Forest fragments with characteristic flora, including members of *Rubiaceae*, *Fabaceae*, *Anacardiaceae*, *Boraginaceae*, *Euphorbiaceae*, and *Sapindaceae*, among others (Pereira & Alves 2007). Color codes follow Online Auction Color (2004); and morphological studies follow methodologies of Baseia & al. (2014) and Melanda & al. (2020). The material is deposited

in Herbário Lauro Pires Xavier, Universidade Federal da Paraíba, Cidade Universitária, João Pessoa, Paraíba, Brazil (JPB).

Taxonomy

Laternea triscapa Turpin, in Levrault, Dict. Sci. Nat. 25: 248. 1822.

Fig. 1

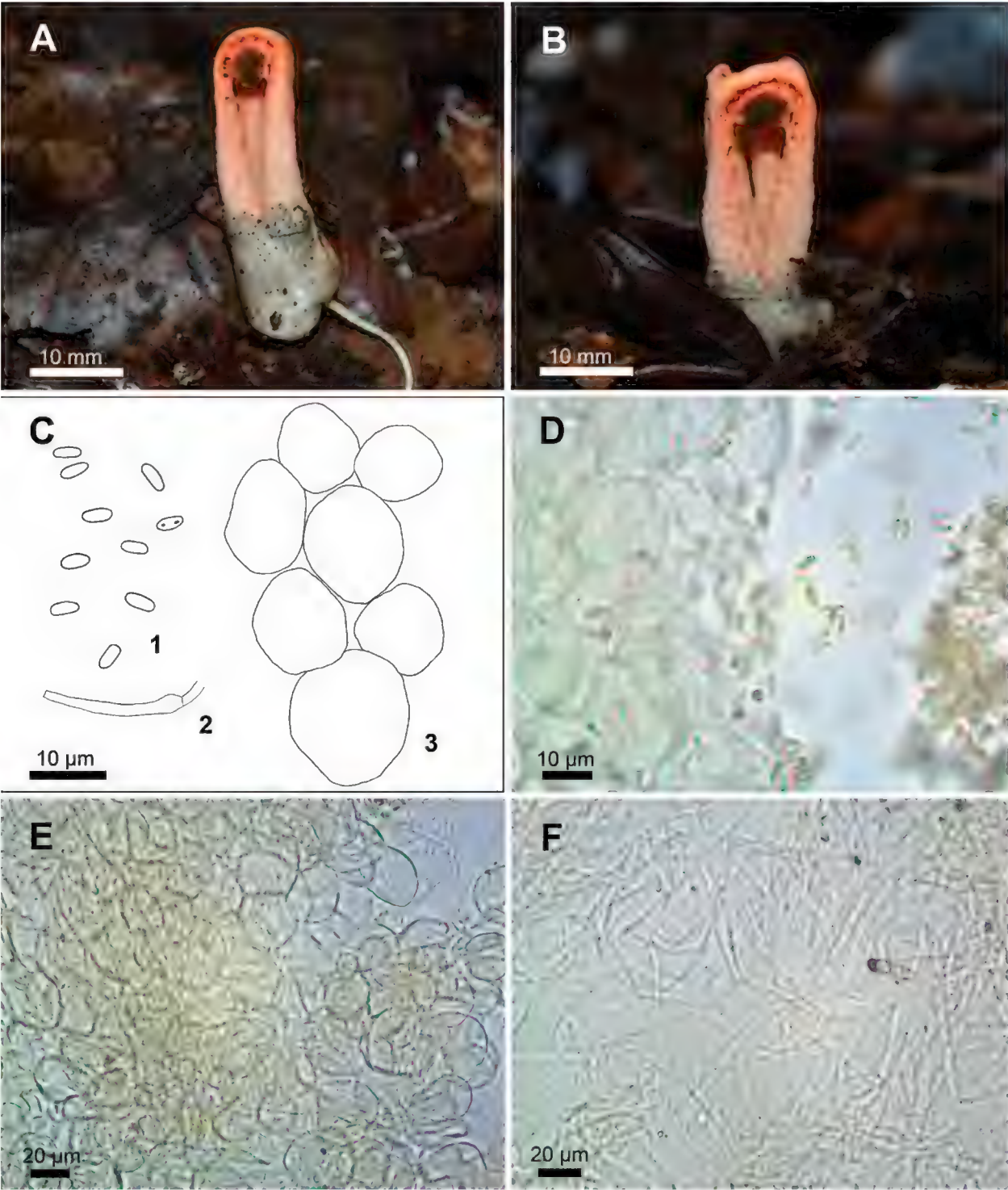


FIG. 1. *Laternea triscapa* (JPB 65670). A, B. Basidioma in situ; C1. Basidiospores; C2. Single volval hypha from the outer grey layer; C3. Elements of the receptacle; D. Basidiospores and adjacent elements of the glebifer; E. Elements of the receptacle; F. Hyphae of the outer grey layer of the volva.

Unexpanded basidiomata not observed. Basidioma small in size, 33 mm high, receptacle erect with four arms, united at apex and free below, with pink-orange color (OAC 651, 652) at apex, paler towards base (paler than OAC 655); each arm is 20 mm high, 3 mm in diam. at base, and 2 mm diam. at apex. Gleba concentrated in an apical salmon-orange (OAC 651, 652) pendant glebifer. Volva very thin, 15 mm high, membranous, whitish (near OAC 909), with greyish brown (OAC 641) appressed dotted squamules. Rhizomorphs present, white (OAC 909).

Basidiospores $4.1\text{--}4.6 \times 1.5\text{--}2.0 \mu\text{m}$, $x = 4.5 \pm 0.4 \times 1.5 \pm 0.2 \mu\text{m}$, $Q = 2.0\text{--}3.3$; $Q_m = 2.8$, hyaline, cylindrical, thin-walled. Receptacle composed of pseudoparenchymatous cells, $12.2\text{--}31.3 \times 11.7\text{--}31.3 \mu\text{m}$, ($x = 19.2 \pm 5.0 \times 18.0 \pm 6.4 \mu\text{m}$, $d = 0.7\text{--}1.5$; $Q_m = 1$), hyaline. Glebifer composed of pseudoparenchymatous cells similar to receptacle ones. Gleba has a mass of basidiospores. Volva of outer grey layer comprising septate hyphae $36.2\text{--}61.2 \times 1.5\text{--}3.1 \mu\text{m}$ ($x = 47.3 \pm 7.9 \times 2.3 \pm 0.7 \mu\text{m}$), hyaline, sometimes slightly swollen near septa, thin to very occasionally slightly thick-walled $\leq 0.5 \mu\text{m}$. Clamp connections absent from all observed septa.

SPECIMEN EXAMINED—**BRAZIL, PARAÍBA, Rio Tinto**, APA Barra do Rio Mamanguape, Mata do Oiteiro, 7.viii.2019, F. Wartchow FW 53/2019 (JPB 65670).

HABIT AND HABITAT: solitary, on soil among litter, in an Atlantic Forest fragment in Northeast Brazil.

CONSERVATION STATUS—This material of *L. triscapa* was collected in a conservation unit with a sustainable purpose (Cabral & al. 2009). Due to the impossibility of defining the population and consequent lack of clear data on abundance and distribution in the locality, we consider this taxon to belong to the category of ‘Data Deficient’ (DD), but more information is required to evaluate it according to the IUCN criteria (IUCN 2019).

Discussion

Our material is characterized by the expanding basidioma 33 mm high, pink-orange above, paler below, and receptacle presenting four arms without crests. In the volva a grayish-dotted squamules on a whitish ground was observed in the field. The specimen is somewhat similar to *Laternea dringii* sensu Lima & al. (2019), from Ceará, Brazil, in basidiomata height (26–40 mm) and basidiospores measurement ($3.5\text{--}4.6 \times 1.1\text{--}2 \mu\text{m}$), but differing only in the orange tonalities of the arms (according to Küppers color atlas used by Lima & al.). The same orange tones occur in specimens identified as *L. dringii* from Paraíba, Brazil (Magnago & al. 2013) and from Veracruz, Mexico (López & al.

1981, López & García 2001), which have smaller basidiomata up to 15 mm high, and (for the Mexican specimens) basidiospores slightly longer and narrower: $4.2\text{--}5(-5.6) \times 1.4 \mu\text{m}$; Magnago & al. (2013: 238) did not measure basidiospores because, according to them, their 'voucher specimen is not preserved'.

The concept for generic placement of *Laternea dringii* by López & al. (1981) into the genus *Laternea* is not supported by the type specimen; the arms were described as red then gradually discoloring to orange then yellow at the base and the gleba is inserted in the lower region of the arms then spreading toward the apex. The protologue (López & al. 1981: 111) and the 'Plate 1' containing 'Figures 1-2' (López & al. 1981: 114) strongly suggest a clathroid fungus (sensu Pegler & Gómez 1994, Ribeiro et al. 2022), probably belonging in *Clathrus* close to *C. columnatus* Bosc, as originally described by Bosc (1811). This was contradicted in the record of the species later published by López & García (2001), who showed a pendant glebifer characteristic of *Laternea*. Unfortunately, there is no available DNA from the type specimen of *L. dringii* to confirm this hypothesis by phylogeny. However, based on its morphological characteristics, we have no doubt that López & al. (1981: 111) described a clathroid fungus. Thus the identity of Brazilian specimens labelled as *Laternea dringii* must be rejected.

Laternea pusilla, originally described from Cuba (Berkeley 1868) has similar basidiomata size to our specimen of *L. triscapa* (20–45 mm tall). However, the Cuban species differs in the reddish arms with crested projections (Sáenz 1976, Sáenz & al. 1983, Calonge & al. 2005, Sandoval-Leiva & al. 2014, Pinzón-Osorio & al. 2017).

Laternea triscapa was defined by Turpin (Levrault 1822: 248–249) as being similar to *Clathrus*, but having a structure described by him as 'conceptacle en forme cul-de-lampe ou de houppe' adhered in a vault produced by the junction of the superior portions of the three arms. In addition, the basidioma was described as measuring two inches (up to 50 mm) high and equally two inches wide in the expanded fungus, and the color was indicated as a 'beautiful vermilion red'.

Since many clathroid species were frequently included in the genus *Laternea*, Linder (1928) and Cunningham (1931, 1944) restored the original concept of Turpin (Levrault 1822). In addition, Linder (1928) collected his material in a sugar cane plantation in Cuba and reported basidioma ranging from 50–62 mm high, 'capucine buff' (= light orange-yellow, moderately orange-yellow, pale orange-yellow, according to Kelly & Judd 1976) at base then 'cadmium orange' (= vivid orange, strong orange, brilliant orange, Kelly & Judd 1976)

toward the apex, bearing three columns, 'nopal red' (= strong red, Kelly & Judd 1976) angled glebifer, and whitish volva. Dennis (1953) also reported the specimens under this name from Trinidad with orange tints.

Later, Dring (1980) performed the most complete revision of *Laternea triscapa*, analyzing materials from Cuba, Haiti, Puerto Rico, Trinidad & Tobago, Belize, and Chile. He found basidiomata up to 70 mm high, vermilion above then pinkish below, three or occasionally four columns, bright reddish orange glebifer, and white egg with sepia stain.

There are other studies citing specimens under this name: Berkeley (1868) reporting a 'pale vermillion' color for Cuban specimens; Rick (1961) reported from South Brazil, with cinnabar receptacle apex and whitish base; Dumont & Umaña (1978) referred to the receptacle as red above and white below in Colombian specimen; and Bononi & al. (1984) reported from Southeast Brazil with receptacle composed of three arms joined at the apex. However, none of them mentioned the presence of a glebifer and the basidiomatal color and shape. Finally, *Laternea triscapa* sensu Baseia & al. (2006) and Leite & al. (2007) clearly corresponds to *Clathrus*, due to the lack of a pendant glebifer.

Thus although difference in the basidioma color, but based in other characteristic mentioned by Turpin (Levrault 1822), Linder (1928), Dennis (1953), and Dring (1980), we consider our specimen as authentic *Laternea triscapa* collected in Brazil, and the most satisfactory defined fungus in its original concept.

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